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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/773,794	02/05/2004	Louis F. Mueller	10040057-1	8449

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AGILENT TECHNOLOGIES, INC.
Legal Department, DL 429
Intellectual Property Administration
P.O. Box 7599
Loveland, CO 80537-0599

EXAMINER

FUJITA, KATRINA R

ART UNIT	PAPER NUMBER
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2609

SHORTENED STATUTORY PERIOD OF RESPONSE	MAIL DATE	DELIVERY MODE
3 MONTHS	01/24/2007	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

If NO period for reply is specified above, the maximum statutory period will apply and will expire 6 MONTHS from the mailing date of this communication.

Office Action Summary	Application No.	Applicant(s)	
	10/773,794	MUELLER ET AL.	
	Examiner	Art Unit	
	Katrina Fujita	2112	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☐ Responsive to communication(s) filed on ____.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-20 is/are pending in the application.
- 4a) Of the above claim(s) ____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) ____ is/are allowed.
- 6) ☒ Claim(s) 1-20 is/are rejected.
- 7) ☐ Claim(s) ____ is/are objected to.
- 8) ☐ Claim(s) ____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 05 February 2004 is/are: a) ☐ accepted or b) ☒ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. ____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|----------------------------------------------------------------------------------------|-------------------------------------------------------------------|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. ____ |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date <u>02/05/2004, 11/17/2006</u> | 6) <input type="checkbox"/> Other: ____ |

DETAILED ACTION

Drawings

1. The drawings are objected to as failing to comply with 37 CFR 1.84(p)(4) because reference character "22" has been used to designate both "processing software" and "imaging chip".
2. The drawings are objected to as failing to comply with 37 CFR 1.84(p)(5) because they include the following reference character(s) not mentioned in the description: Numerals 20 (figure 1), 24 and 25 (figure 2).

Corrected drawing sheets in compliance with 37 CFR 1.121(d), or amendment to the specification to add the reference character(s) in the description in compliance with 37 CFR 1.121(b) are required in reply to the Office action to avoid abandonment of the application. Any amended replacement drawing sheet should include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. Each drawing sheet submitted after the filing date of an application must be labeled in the top margin as either "Replacement Sheet" or "New Sheet" pursuant to 37 CFR 1.121(d). If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

Specification

3. The disclosure is objected to because of the following informalities:

Page 6, line 8, "stage 50" should be "stage 10". This appears to be a typographical error.

Page 6, line 18, the second instance of "target plane 58" should be "target plane 59". This appears to be a typographical error.

Page 7, line 23, " Δx " should be " Δx_1 ". This appears to be a typographical error.

Table 2, $\Delta W_0/\alpha$, element dR_x , "-Z" should be "Z". This appears to be a typographical error.

Appropriate correction is required.

Claim Rejections - 35 USC § 102

4. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(a) the invention was known or used by others in this country, or patented or described in a printed publication in this or a foreign country, before the invention thereof by the applicant for a patent.

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section

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351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

5. Claims 1, 3-4, 6, 11, 13-15, 17 and 19 are rejected under 35 U.S.C. 102(b) as being anticipated by Michael et al. (US 5,960,125; hereinafter referred to as Michael '125, which incorporates teachings from Michael et al. (US 6,137,893; hereinafter referred to as Michael '893) and consequently, Michael (US 5,548,326; hereinafter referred to as Michael '326)).

Regarding **claims 1, 11 and 19**, Michael '125 teaches a system and method to determine a position of a stage ("calibrating the reference frame of a camera to that of a movable object (e.g. motion stage)" at col. 2, line 3), comprising:

capturing images ("cameras 54a, 54b, 54c generate images of respective portions of the object" at col. 8, line 61; figure 5; "The image acquisition device may be a video camera, charge coupled display (CCD) device" at col. 5, line 55) of a plurality of targets located on the stage ("multiple targets 58a, 58b, 58c on the object" at col. 9, line 8; figure 5; "instances where the object 12 is the motion stage 15 itself" at col. 7, line 13);

Michael '893, referenced by Michael '125, teaches a method of determining position and orientation of targets in an image ("targets and methods for determining their location and orientation in an image" at col. 1, line 16), which employs image registration as taught by Michael '326.

Michael '326 teaches a method of image registration that comprises

processing means ("general-purpose microprocessor" at col. 7, line 24; "specialized computational circuitry" at col. 7, line 31) for comparing ("second image to be registered with respect to the first image" at col. 3, line 39) a captured image of a target (figure 2, numeral 26) with a stored image (figure 1, numeral 12) to determine displacement coordinates for the target ("initial relative displacement A" at col. 8, line 9 "neighboring-pixel relative displacements" at col. 8, line 17); and,

translating the displacement coordinates for the targets into position coordinates for the stage ("registration parameters for placing the pair of digitized images in registered relationship" at col. 8, line 7; figure 4, numeral 52).

Regarding **claims 3 and 13**, Michael '125 discloses a system and method that includes three targets (figure 5, numerals 58a, 58b, 58c).

Regarding **claims 4 and 14**, Michael '125 discloses a system and method wherein capture of the images is performed by a plurality of sensors, one for each target (figure 5, numerals 54a, 54b, 54c).

Regarding **claims 6 and 15**, Michael '125 discloses a system and method wherein there are two displacement coordinates for each target ("relative displacement can be specified using the variables u and v" at col. 6, line 55; figure 5).

Regarding **claim 17**, Michael '125 discloses a system and method wherein the position coordinates for the stage are absolute coordinates from a reference location ("field of view positions are computed with respect to an absolute coordinate system" at col. 11, line 22).

Claim Rejections - 35 USC § 103

6. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

7. Claims 2 and 12 are rejected under 35 U.S.C. 103(a) as being unpatentable over Michael '125 in combination with Douglas (US 5,943,089).

Michael '125 teaches the elements of claims 1 and 11 as described in the 102 rejection above.

Michael '125 does not teach a system and method wherein capturing images includes illuminating the plurality of targets.

Douglas discloses a system and method in the same field of endeavor of image-based alignment system ("alignment system having a video probe" at col. 2, line 14) wherein capturing images ("video camera 212 is arranged to receive images" at col. 4, line 13) includes illuminating a plurality of targets ("Light sources 232 and 234 respectively provide illumination" at col. 4, line 18; figure 3, numerals 232, 232; figure 2, numerals 204-1, 202-1).

It would have been obvious at the time the invention was made to one of ordinary skill in the art to utilize the video probe as taught by Douglas as the capturing device

required by Michael '125, to be able "to prevent lighting voids in the reflection from the objects" at col. 4, line 29).

8. Claim 5 is rejected under 35 U.S.C. 103(a) as being unpatentable over Michael '125 in combination with Guha et al. (US 2002/0109112).

Michael '125 does not teach a system and method wherein the imaging chips perform comparison of the captured images.

Guha discloses a system and method in the same field of endeavor of image-based monitoring systems ("smart camera approach to a web inspection system" at paragraph 0036, line 1) wherein comparison ("Flaw detection is based upon template matching" at paragraph 0060, line 7) of a captured image ("video stream from a line scan camera" at paragraph 0060, line 8) with a stored image ("subtracts the web image output of an image buffer 520 from an image in a template buffer" at paragraph 0060, line 19) is performed by a camera system ("web smart camera" at paragraph 0060, line 8; figure 7, numeral 502).

It would have been obvious at the time the invention was made to one of ordinary skill in the art to utilize the smart camera as taught by Guha as the imaging chip required by Michael '125, to be able "requires a limited number of components thus increasing the mean time between failure" at paragraph 0016, line 2).

9. Claims 7, 10, 16, 18 and 20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Michael '125 in combination with Wallack (US 6,771,808).

Michael '125 teaches the elements of claims 1, 11 and 19 as described in the 102 rejection above.

Regarding **claims 7 and 16**, Michael '125 does not teach a system and method wherein there are six position coordinates for the stage.

Wallack discloses a system and method in the same field of endeavor of machine vision ("machine vision systems" at col. 1, line 9) wherein there are six coordinates accounted for during an object's image registration (figure 1, numeral 118; "six-degrees of freedom" at col. 6, line 14).

It would have been obvious at the time the invention was made to one of ordinary skill in the art to utilize the search tool as taught by Wallack to train the vision system required by Michael '125, to be able "to register the instance of a pattern in an arbitrary six-degree-of-freedom pose" at col. 3, line 23).

Regarding **claims 10, 18 and 20**, Michael '125 does not teach a system and method wherein the six position coordinates are translational and rotational movements along three axes.

Wallack discloses a system and method wherein the six position coordinates are:
translational movement along a first axis ("transformation of the image along orthogonal x" at col. 5, line 7);

translational movement along a second axis ("transformation of the image along orthogonal...y-axes" at col. 5, line 7);

translational movement along a third axis ("translation of an image along the z-axis" at col. 5, line 4);

rotational movement along the first axis ("differing levels of aspect/shear" at col. 3, line 35; figure 1, " Ψ ");

rotational movement along the second axis ("differing levels of aspect/shear" at col. 3, line 35; figure 1, " Φ "); and

rotational movement along the third axis ("angular rotation (θ)" at col. 5, line 11).

It would have been obvious at the time the invention was made to one of ordinary skill in the art to utilize the search tool as taught by Wallack to train the vision system required by Michael '125, to be able "to register the instance of a pattern in an arbitrary six-degree-of-freedom pose" at col. 3, line 23).

10. Claim 8 is rejected under 35 U.S.C. 103(a) as being unpatentable over Michael '125 in combination with Batterman et al. (US 5,856,844).

Michael '125 does not teach a system and method wherein the targets are placed at oblique angles to all surfaces of the stage.

Batterman discloses a system and method in the same field of endeavor of determining the position and orientation of an object ("determining degrees of freedom of an object" at col. 1, line 9) wherein targets ("patterns" at col. 12, line 18) are placed at oblique angles (figure 11, numerals 80B, 80C).

It would have been obvious at the time the invention was made to one of ordinary skill in the art to utilize the angled patterns as taught by Wallack as the targets required by Michael '125, because the "range of degrees of freedom is increased" at col. 12, line 20).

11. Claim 9 is rejected under 35 U.S.C. 103(a) as being unpatentable over the combination of Michael '125 and Batterman as applied to claim 8 above, and further in view of Michael et al. (US 5,768,443; hereinafter referred to as Michael '443).

Michael '125 teaches the elements of claim 1 as described in the 102 rejection above and the elements of claim 8 as described in the 103 rejection above.

Michael '125 does not teach a system and method wherein for each target, a sensor from the plurality of sensors is aligned nominally perpendicular to the target plane.

Michael '443 discloses a system and method in the same field of endeavor of machine vision ("machine vision systems" at col. 1, line 6) wherein for each target ("calibration target" at col. 5, line 11; figure 2), a sensor from the plurality of sensors (figure 4, numerals 34, 36, 38; "one plane for each camera" at col. 5, line 42) is aligned nominally perpendicular to the target plane ("perpendicular to the plane of the calibration target" at col. 4, line 16).

It would have been obvious at the time the invention was made to one of ordinary skill in the art to utilize the alignment as taught by Michael '443 in the camera placement required by Michael '125, to eliminate image distortion due to the "tilt of the camera in either the X- or Y-axis with respect to the plane of the calibration target" at col. 6, line 41).

Conclusion

12. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. US 5,206,820, US 6,222,940, US 6,301,396, US 6,556,722, US 6,671,049, and US 6,697,761 are each pertinent as teaching image-based systems that determine position and orientation.

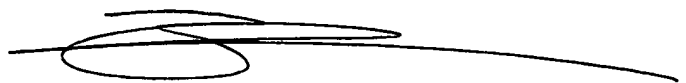
Any inquiry concerning this communication or earlier communications from the examiner should be directed to Katrina Fujita whose telephone number is (571) 270-1574. The examiner can normally be reached on M-Th 8-5:30pm, F 8-4:30pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Brian P. Werner can be reached on (571) 272-7401. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.



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